

STEPHEN HAWKING'S BAD METAPHYSICS

Notes on Stephen Hawking's *A Brief History of Time*

PREFATORY

You will think me mad to comment on Stephen Hawking's *A Brief History of Time*. I may be mad but I hope I am not such an imbecile as to comment on Hawking's science. Yet such a book will contain implicit or explicit, conscious or unconscious, philosophical and metaphysical assumptions. It is with these that I am concerned. My intention was originally not so much to comment as to offer marginal reflections but eventually I found myself obliged to comment critically at certain points. It may be that my being an outsider to science helps me see things that scientists find it difficult to perceive from within their special universe of thought. Initially I expected my comments to focus on Chapter 8, "The Origin and Fate of the Universe", and the concluding chapter but then I found that I had on my hands more than I had anticipated.

Intelligent non-scientists dread exposing themselves to ridicule if they point out the flaws in advanced scientific thinking. The ridicule would be in place if the non-scientist tried to criticize scientific work from within. But in discussing the possibilities and the limitations of knowledge, both the scientist and the intelligent non-scientist are on common ground. And someone has to take the risk. For myself I have nothing to lose if I am ridiculed, for I am in any case a nonentity. In making a detailed comment on a particular point I may make a howler and reveal my ignorance, but on general issues I do not concede that I am at a disadvantage.

Some time ago I made some comments on parts of Roger Penrose's *Road to Reality* (included in *Plato's Universe of Discourse*, 2015). I did not know then of Penrose's and Hawking's collaboration. My approach to Penrose there was different from my approach to Hawking in the present paper. Hawking touches on metaphysical questions marginally and does not work the metaphysics into the scientific theory. Penrose on the other hand delves into metaphysics with full intent and, seduced by a misconceived Platonism, speaks boldly of Reality. I confined my examination to the openly metaphysical parts of Penrose's book.

Following an inveterate habit of mine I write my comments as I read on. This method has serious pitfalls. In the revision some of the blunders and misunderstandings may be removed but there remain craggy edges and unsmoothed junctions.

I am using the electronic edition, 2001, updated, incorporating additional material and a new chapter on wormholes. All citations refer to the PDF pages of the electronic edition.

FOREWORD

In his foreword to the electronic edition Hawking says that however it be with the possibility “of the unification of the laws of science”, the most important point remains “that the universe is governed by a set of rational laws that we can discover and understand” (p. 2). I prefer to say that the universe displays regularities that we can represent as ‘laws’. I wish that scientists would drop the metaphor of ‘laws that govern’ the universe: it can lead to confused and erroneous thinking. In the paper on Penrose this was a major issue.

Hawking speaks of “fluctuations (that) are the finger-prints of creation” (p. 2). Again ‘creation’ is another notion that has no rightful place in scientific thinking. Philosophically I say that ultimate reality is creative. That is a different matter and it is of no relevance to science. But creation out of nothing and by nothing is an utter absurdity. Scientists should realize that speaking of an ultimate origin of the universe is meaningless blabber or at best very loose talk. Our actual particular cosmos may have started with a bang or grew out of a god particle, but the thing that banged or the god particle must have been there in the first place. An absolutely ultimate origin (entailing a beginning and a ‘history of time’) doesn’t fit into the methodology of science. The objectivity of science means that science must have something given to work on. Mathematics invented the point and invented the zero, which do not exist, but mathematics works with ideas in the mind, not with things. The propositions of mathematics are, as Kant tells us, synthetic a priori judgments, a thing that is anathema to science – traditional science at any rate – which has to deal with what actually exists and not with the creations of pure reason. It seems to me that modern physics in effacing the boundary between empirical science and mathematics has led itself into a veritable maze. Scientists are developing equations, theories, scenarios, that are strictly unverifiable. (Hawking in speaking about theory in science admits that much.)

CHAPTER 1 – OUR PICTURE OF THE UNIVERSE

Hawking admits that the most advanced physical theories are just that, unverifiable theories but still hankers after the unattainable. He appears to be aware of the

inanity of the question about the beginning of the universe. “Where did the universe come from, and where is it going? Did the universe have a beginning, and if so, what happened *before* then?” (Ch. 1, p. 3) Yet again and again he reverts to the question and seems not to give up hope of finding the answer.

When we speak of “the beginning of the universe” we should, to avoid slipping into nonsense, clearly define our terms, specify precisely what beginning and what universe we are speaking of. An absolute beginning and the universe in the sense of the metaphysical All are beyond the range of any human knowledge.

Wittgenstein was right when he denied the possibility of making any statement about the World, but even Bertrand Russell could not get the point. (See Russell’s own account in *My Philosophical Development*, p. 86, which I discussed in “The Wittgenstein Enigma”, *The Sphinx and the Phoenix*, 2009.)

Aristotle’s First Cause does not refer to a beginning in time or out of time but to a rational ground for the intelligibility of the mystery of Being. This is beyond the reach of science. Science achieved its astounding successes from the seventeenth century onwards when it limited itself to the empirical. Kant underlined that. Scientists are now forgetting it. They have transgressed beyond the empirical into the metaphysical. This does not extend the scope of science; instead it causes utter confusion.

Then we have the question: “What is the nature of time?” (p. 3) To my mind this is an ill-formed question. It suggests that time is a thing with a nature of its own. There is no such thing as time. You can never observe time or measure time or put time under a microscope, although astrophysicists may fancy that they can observe time through their giant telescopes. Time is a fiction, a myth, that enables us to connect successive impressions — no less a fiction than Newton’s force of gravitation. But the fiction is so useful for science (and for our quotidian doings) that even a Newton could speak of absolute time, which is an absurdity as Leibniz saw. (Time is discussed more fully below.)

“Will it (time) ever come to an end?” (p. 3) This is a question science cannot answer and is not entitled to pose. Our most ambitious scientists, working at the very edge of the reach of science, are doing (bad) metaphysics and fancy themselves doing science. It may be said that in posing his questions about time, Hawking is not thinking of abstract ‘time’ but of time as an index to the ceaseless change and becoming, the endless flux of Heraclitus, the aboriginal process of Whitehead. My remarks still hold.

An infinite (infinitely extended) universe is simply unthinkable, unintelligible; Parmenides thought so. Again, a finite universe breeds absurdities. Scientists may

find it profitable or convenient to work with this assumption or that, but they cannot assert this or that as a fact, as more than a working fiction. Even if their calculations or predictions work well with either assumption, that is just that; it would be an assumption that works well within a conceptual universe of our own creation. The question about the extent of the universe is nonsensical. Scientists will go on endlessly probing further and further outwards into space or deeper and deeper into whatever they take to be the first element of things, they will only be producing interpretations of — of what? Of other interpretations. Philosophically we create visions, metaphysical and moral, that infuse meaning and value into our experienced (subjective) life. Scientifically we create conceptual patterns that confer intelligibility on our observable (objective) world. Doesn't the fact that neither an infinite universe nor a finite universe is thinkable indicate that our notion of space is basically flawed, is intrinsically contradictory, is a fiction of our own creation?

Hawking is well aware of “the pitfalls that you can encounter in talking about infinity” (p. 5). But I don't think the concept of a finite universe or an expanding universe is less problematic, even if it works well for present-day scientists. After all the idea of an infinite universe worked well for Newton. And does the notion of an expanding universe really escape the dilemma? Don't we have to think of it as at any particular moment limited, i.e., finite?

Hawking speaks of considering “the finite situation” and then asking “how things change if one adds more stars roughly uniformly distributed outside this region” (p. 3). Are we entitled to ask: How many more? If it is more and more, we are back with infinity, or a pseudo-infinity, an unintelligible neither-nor. Hawking says: “We now know it is impossible to have an infinite static model of the universe” (p. 5). This leads to the suggestion of an expanding or a contracting universe. I do not want to be drawn into the whirlpool of scientific hypotheses, yet it seems that scientists rashly plunge into metaphysical whirlpools. Or it may be that at the frontiers of science, when it deals with the ‘infinitely’ big or the ‘infinitely’ small (general relativity and quantum mechanics) scientists are no longer doing science but indulging in bad metaphysics. Nobody can forbid them to exercise their imagination in bold speculations, but they should openly admit that that is what they are doing.

In a bracketed sentence Hawking writes: “Within the universe, you always explained one event as being caused by some earlier event, but the existence of the universe itself could be explained in this way only if it had some beginning” (p. 6). That's just it. The world has no beginning. So why all the loose talk about the

beginning of the universe or the beginning of time? This is what Wittgenstein censures as a misuse of language.

Marginally: Hawking describes Kant's *Critique of Pure Reason* as "very obscure". (p. 6) I'm amused. If Stephen Hawking finds the *Critique* obscure, that serves Immanuel Kant right! It confirms what I have repeatedly said, that Kant harmed himself by housing his profound and fundamental insights in his curious architectonic scaffolding.

Hawking misrepresents Kant's argument in the Antinomies and is completely mistaken in speaking of Kant's "unspoken assumption that time continues back forever". (p. 6) This 'unspoken assumption' may have been implied in the putative arguments for either of the opposed theses. That was the ground for Kant's rejection of both theses. Kant explicitly says that time is a mode of the understanding, something that the mind projects, a form in which the mind clothes the experiential content. As such how could it 'extend back forever'? In fact, the long digression on creation in Ch. 1 (p. 6) is quite pointless. What does a book of physics have to do with *Genesis* and Augustine's *City of God*? If anything, this indicates that Hawking does not see that scientific and metaphysical questions are completely separate as Socrates saw and asserted.

As if answering what I have been saying above, Hawking writes:

"When most people believed in an essentially static and unchanging universe, the question of whether or not it had a beginning was really one of metaphysics or theology. ... But in 1929, Edwin Hubble made the landmark observation that wherever you look, distant galaxies are moving rapidly away from us. In other words, the universe is expanding. This means that at earlier times objects would have been closer together. In fact, it seemed that there was a time, about ten or twenty thousand million years ago, when they were all at exactly the same place and when, therefore, the density of the universe was infinite. This discovery finally brought the question of the beginning of the universe into the realm of science" (p. 7).

As I see it, this does not mend matters. The confusion and the loose language are still there. The metaphysical question remains metaphysical. (And lest anyone should think I am alleging that metaphysics can answer the question, let me assure you I maintain metaphysics only gives us myths, fairy tales, that are pleasant and aesthetically satisfying.) That we 'know' that the mass of all the galaxies was once concentrated in one place may make it legitimate for scientists to investigate the history of the unfolding of that ancient concentrated mass into galaxies. That may be called the beginning of the present configuration of the stars and whatever other

stuff is spread in between the stars. Wittgenstein reduced all metaphysics to bad syntax. The statement that “the question of the beginning of the universe (has been brought) into the realm of science” eminently qualifies for the honour. (Further on we will see that the strictly unthinkable ‘infinite density’ is a ‘singularity’ at which all the laws of science break down and which we have to find our way out of.)

“The eventual goal of science is to provide a single theory that describes the whole universe. However, the approach most scientists actually follow is to separate the problem into two parts. First, there are the laws that tell us how the universe changes with time. ... Second, there is the question of the initial state of the universe. Some people feel that science should be concerned with only the first part; they regard the question of the initial situation as a matter for metaphysics or religion. ... It ...seems ...reasonable to suppose that there are also laws governing the initial state” (p.7-8).

I find nothing in this to make me modify anything of what I have said above except that it is now clear that Hawking does not slide unawares into the metaphysical arena but marches there with wide-open eyes. So what is wrong with a scientist having what I call a metaphysical vision? I find in that one minor trap and one highly pernicious error. The minor thing is that scientists are in the habit of reporting actual states of affairs. If they want to venture into metaphysical speculation, they should announce that clearly and should keep their science and their metaphysics unmixed. Now for the serious thing. A. N. Whitehead protested in *Science and the Modern World* against physicists imposing on us the Fallacy of Misplaced Concreteness which depleted our world of colors and smells and textures. I am afraid Hawking’s physicometa-physics will deprive us of much more: a universe, governed by physical laws at the highest level of generality, presented as what is ultimately ‘real’ and as all-there-is will, to put it most mildly, trivialize all feeling, all moral values, all beauty.

Hawking closes the first chapter by saying: “Today we still yearn to know why we are here and where we came from. Humanity’s deepest desire for knowledge is justification enough for our continuing quest. And our goal is nothing less than a complete description of the universe we live in” (p. 9). I will only add two brief remarks. (1) The “why we are here” can never be disclosed by any objective investigation, any investigation into nature, at any rate if our question is not reduced to: how did it come about that we are here? This latter question is for science to answer but it is quite distinct from the why question. (2) A “complete description of the universe we live in”? Complete? Complete without love, without tears, without smiles? These no science can comprehend, no objective account can encompass.

CHAPTER 2 – SPACE AND TIME

I said I would not comment on the scientific material, and so I have been reading Chapter 2 meekly huddled at the feet of the master, but I could not let this passing remark pass without a counter remark: “Bishop Berkeley ...believed that all material objects and space and time are an illusion” (Ch. 2, p. 11). Berkeley did not believe that ‘material. objects and space and time’ were illusions, any more than Plato did as is too often alleged. For Berkeley it was the notion of a material object that was an illusion. For him all things are ideas in the mind of God, or we may say, in the all-sustaining Mind, the *Deus cive Natura* of Spinoza. Would Bishop Berkeley condone the blasphemy of making the mind of God hold illusions? For him as for Plato the ideas are real and are the sole standard of reality.

Hawking says: “It is impossible to imagine a four-dimensional space. I personally find it hard enough to visualize three-dimensional space!” (p.14) It is impossible because the idea of four-dimensional space is a fictional combination, a ruse for locating an event. In actual life we live with events and have always been living with events as integral wholes out of which we abstract the fictional notions of space and time. All things are in space-time: but this statement, like all determinate formulations of thought or language is contaminated with falsehood and the germ is in that ‘in’, for there is no separable container that holds things and that we can visualize. A smile, a kiss, is a real thing in which place and time are inseparable. We can easily imagine, or experience, a smile or a kiss. We then create the two fictions ‘time’ and ‘space’. These, separately, have served us for so long. Lately we found it useful to make one chimera out of the two, but as there is no such thing we cannot visualize it. This takes us back to what I said about the “complete description of the universe” that scientists promise us and that would leave our world bereft of all reality and all value. Let me put it bluntly: Science cannot give us an account of anything real, really real, Platonically real. Science can calculate the distance to the farthest galaxy reached by the most sophisticated telescope but can never account for a gush of joy or a pang of pain. With Shakespeare and Goethe and Shelley I say that it is these that are real. All the rest, including our own bodies, are “such stuff as dreams are made on”.

Hawking finds it “hard enough to visualize three-dimensional space”. It’s not hard, it’s impossible. We see and touch and handle three-dimensional things. These make up actual three-dimensional space. Abstract three-dimensional space is an idea in the mind. You can think a triangle but you cannot visualize a triangle that is just a triangle. You can only visualize a particular triangle, right-angled or

isosceles or scalene. You cannot visualize three-dimensional space; it has to be a table or a chair or a ball. You cannot visualize space-time but we are all the time experiencing things moving, things growing, things dwindling. These are not in space AND in time; these are in space-time. A bird in flight is not reducible to space and time; it is an instance of duration: ‘duration’ or Whitehead’s ‘event’ is a much better term for philosophical purposes than space-time.

Let me venture this whimsical thought. Newton said that bodies attract one another by a mysterious force called gravity. Einstein said that the earth and other planets move as they do because space-time is curved. The long and the short of it is that we can calculate, are happy that our calculations work, but do not know why they work. Gravity and the curved space-time are in a class with the ether with which scientists worked happily for a time.

Let me reiterate. I protest not at the marvelous things that scientists are discovering or visioning but mainly at the loose language which, taken without caution, transmutes their statements from good science into bad metaphysics. Thus Hawking speaks of “a dynamic, expanding universe that seemed to have begun a finite time ago, and that might end at a finite time in the future” (p. 21). This is all right when it is made clear that we are speaking of the present configuration of all the stuff that makes up our present cosmos but it becomes nonsense when taken to refer to the All and the Ultimate — words that perhaps have no meaning for scientists, but it does them no harm to say, Well, we do not mean these; we are speaking of a universe that had a beginning that must have had an ante-beginning and that will have an end that will make way for a post-end: we are certainly not speaking of Plato’s Reality or Aristotle’s Being or Spinoza’s Substance.

CHAPTER 3 – THE EXPANDING UNIVERSE

Hawking says that “Yet so strong was the belief in a static universe that it persisted into the early twentieth century” (Ch. 3, p. 24). I venture to say that Heraclitus would have known that the universe could not be static. When he said that a new sun is born every day I do not think he meant that the setting sun vanishes and a new sun takes its place but that the sun that comes up tomorrow will not be the same sun that is shining today since it is ceaselessly changing internally.

I was tempted to quote at length from the long passage (in Ch. 3) where Hawking explains the breaking down of predictability at the big bang. Suffice it to say that it amounts to saying that all science and all mathematics, in other words all rational thinking, breaks down “at the big bang”. Doesn’t this mean that the

question of the ultimate origin or ultimate beginning is strictly outside the range of science? Indeed, as Kant and before him Plato saw, it is outside the reach of reason. Shouldn't scientists (and philosophers) have the modesty to acknowledge the limits of human knowledge? (Hawking pins his hopes on uniting quantum mechanics and general relativity but, as we shall see, that doesn't help.)

We are told that the steady state theory" which was propounded in 1948 requires "the continual creation of matter" (p. 28). Creation? Wherefrom or by whom? We have to say we know not. We are back to the need to confess our ignorance. Why shouldn't that be our final answer? Science can tell us many wonderful things but there are questions which science is not equipped to handle.

CHAPTER 4 – THE UNCERTAINTY PRINCIPLE

We read that "calculations by the British scientists Lord Rayleigh and Sir James Jeans suggested that a hot object, or body, such as a star, must radiate energy at an infinite rate" (Ch. 4, p. 31). Does this not suggest that scientists have reached the point where the further application of their methodology inevitably leads to absurdities? The infinite genie that mathematicians had tethered to their service has now turned into a monster that wrecked the magnificent edifices of the physicists.

I do not need the Heisenberg principle or any other scientific principle or discovery to counter Laplace's contention. All scientific laws are necessarily generalizations that cannot take into account the special variations in a particular situation. Hence all scientific laws are approximations that leave room for variations and deviations. What is more significant is that we experience immediately and indubitably the reality of our creativity in spontaneous deeds and in poetic and artistic creation. This makes the notion of creativity as an ultimate metaphysical principle of reality, to say the least, understandable. I have dealt with this in "Free Will as Creativity" (in *The Sphinx and the Phoenix*, 2009) and elsewhere and will not expand on it here.

Can we say that in dealing with the very large and the very small science reaches a threshold that it is not permitted to cross? Would that be because the foundational principle of science is to observe and to measure, so that when it gets to where there can be no observation or measurement it can no longer function? Science made its amazing advances from the seventeenth century onwards when it adopted for its credo empiricism and objectivity. Now physicists busy themselves with mathematical theories that can be neither empirical nor objective. Merging physics with mathematics leaves physics dangling in mid-air, neither firmly grounded in

empirical observation nor freely moving in the sky of pure theory.. Likewise when mathematics was turned into pure logic, Wittgenstein found it can say nothing substantive.

CHAPTER 5 – ELEMENTARY PARTICLES AND THE FORCES OF NATURE

“Using the wave/particle duality ... everything in the universe, including light and gravity, can be described in terms of particles” (Ch. 5, p. 37). That’s just it, everything can be described in terms of this or that, and that’s the whole of human knowledge. Describing anything in terms extraneous to the thing, however useful it may be for specific purposes, falsifies it and can never disclose its essence or true nature.

“A particle of spin 0 is like a dot: it looks the same from every direction” (p. 37). Again loose language and loose imaging. A Euclidean dot does not ‘look’ like anything. If a dot has any looks at all (1) it is not a dot; (2) it will look differently from different directions. I suppose a Leibnizian monad will be reflected differently in different sister monads. Again I must emphasize that I am not criticizing the science behind the expression. I only mean to say that, science having reached the region of the unspeakable and unimaginable, should confine itself to workable equations and should stop pretending that it speaks about the world of actual things — let alone about reality. The only reality is the reality we live.

“We now know that every particle has an antiparticle, with which it can annihilate ... There could be whole antiworlds and antipeople made out of antiparticles. However, if you meet your antiself, don’t shake hands! You would both vanish in a great flash of light.” (p. 38). I have nothing to say. I simply could not resist quoting this gem! Let me just add that the word ‘know’ above is a flagrant fraud!

CHAPTER 6 – BLACK HOLES

At one time some physicists thought light was composed of particles while others thought it was composed of waves. Now they tell us that both views are right (Ch. 6, p. 44). A fool like myself takes this to mean that both views are wrong. But let us be more generous. Let us say that in certain situations and for certain purposes it is more convenient or more efficient to make our calculations and our predictions on this assumption and in other situations and for other purposes on that. Does this

not simply mean that in fact we neither know nor can mentally picture what light is like? Or better still, that light is not like anything? Or even better yet, that we don't know and can never know? Science creates conceptual patterns, formulated as laws or equations, that luckily match observed phenomena. This agrees with Kant's assertion that human understanding is confined to the phenomena of nature but is denied access to noumena. Nature is a goddess that deigns to show us aspects of her mien but will not reveal her heart.

I just cannot stomach this blatant contempt of language. 'Black holes' are stars, massive, compact, with great gravitational attraction, yet they are so designated "because that is what they are: black voids in space"! (p. 44) As if it is not bad enough to call a compact mass a hole, it is also a black void. Let me repeat, I am not discussing the science behind the words; I am protesting against the corruption of language. Scientists have their experiments, their observations, their calculations to work with: let them not grudge us poor philosophers the only tool we have, words. When we philosophers (and poets) get to the ineffable we make myths. When scientists get to the unspeakable they should be content with making equations.

A 'big bang singularity' can only be meaningful in a scenario of transcendent theism. Otherwise we have simply to say that science is not qualified to deal with ultimate beginnings and ultimate ends. If the world goes, phoenix-like, through cycles of annihilation and rebirth, science can only deal with the happenings within the current cycle, but not with the beginning and not with the end.

I am not concerned with the truth or falsehood of the big bang theory or any other theory. I am concerned to affirm that no theory, physical or metaphysical, can give an answer to the question why there is anything at all; this is the ultimate mystery of being. Say that space-time began at or from or by a singularity christened Big Bang. If we are not to throw overboard all reason and all understanding we must put some sense in the terms 'singularity' and 'space-time'. I copy these four definitions from Hawking's Glossary:

Big bang: The singularity at the beginning of the universe.

Big crunch: The singularity at the end of the universe.

Singularity: A point in space-time at which the space-time curvature becomes infinite.

Space-time: The four-dimensional space whose points are events.

The definition of space-time is not of much help for my present purpose; I venture to take space-time to refer to our present cosmos from its birth to its demise. The definition of a singularity must give us much pause. In the first place I don't find a definition for the key-term 'infinity' in the glossary and I stubbornly maintain that an actual or actualized infinity is sheer nonsense. To actualize infinity is to put an end to what is by definition endless. Then we are told that a singularity is 'a point in space-time'. A geometrical point has a virtual place but no real place anywhere; a point in space-time is either a fiction or is not a true point. Then we have the infinite curvature: Indeed in Ch. 3 we were explicitly told that "the general theory of relativity ... predicts that there is a point in the universe where the theory itself breaks down" (p. 28). We were also told that a singularity is just such a point where our theory and all predictability break down. I must reiterate that I am not questioning the science around all this or behind all this. I am simply insisting that scientists have to moderate their language; they have to admit that however far we go, the absolute beginning and the absolute end are beyond human knowledge, not only practically but in principle. I said above let us take space-time to refer to our present cosmos from bang to crunch: shall we say that the bang was rooted in nothingness and that the crunch will lead to nothingness? Our mind recoils at that. Shall we say there was a world before our world that somehow generated our world? That is fancy. Shall we say the world was created by a God outside the world? Where did God come from? Willy-nilly we have to admit that Being is an ultimate mystery that we cannot crack. That mystery is the concern of metaphysics. Can metaphysics solve the mystery? My answer is a decided No. What use is metaphysics then? Since the mind's questioning about the mystery cannot be silenced, since the human yearning to belong to the All cannot be stilled, human beings have mythologized from the earliest times and metaphysics continues to mythologize to lull our questionings and our yearnings. Someone may ask: Why shouldn't scientists do the same? By all means let them do, but they should not call that science. The dogmatism of science is not more palatable than the dogmatism of theology. At many points Hawking shows that he well knows that an absolute beginning and an absolute end are beyond the reach of science. But sometimes his language is unwary or he wavers. More to the point, scientists in general refuse to see this.

CHAPTER 8 – THE ORIGIN AND FATE OF THE UNIVERSE

Quantum mechanics may help out in the detailed working of the consequences of general relativity but seems to end up with the same gaping void. Thus we read that "when quantum effects were taken into account, it seemed that the mass or

energy of the matter would eventually be returned to the rest of the universe, and that the black hole, along with any singularity inside it, would evaporate away and finally disappear” (Ch. 8, p. 61). First we have energy returned to the universe and then the black hole together with the mysterious singularity ‘inside it’ evaporate and finally disappear. Evaporate? Does that mean give off something? Disappear? Does that mean all the mass with its singularity have come out as energy? Or does the black hole with its singularity vanish in obedience to a magician’s wand? And what about the energy ‘returned to the universe’? Does it also magically disappear? Do we end up with sheer nothingness? Does that help with the problem of the beginning? I repeat *ad nauseam* I am not questioning the calculations or the predictions. I am simply saying that does not entitle us to speak of a beginning or an end if we are to have some respect for language, if we are to have some respect for our minds.

Hawking continues the lines I quoted above by posing the question: “Could quantum mechanics have an equally dramatic effect on the big bang and big crunch singularities? ... Does the universe in fact have a beginning or an end?” My position is that this question is not kosher for science. Whatever help quantum mechanics (with its uncertainty principle) may have for the impasse of the bang and the crunch, it will necessarily leave us either with a beginning requiring a prior beginning or with utter nothingness out of which unaccountably the beginning began, and we are back with the fiat of the transcendent God. Let us see.

Hawking writes: “...in 1981 my interest in questions about the origin and fate of the universe was reawakened when I attended a conference on cosmology organized by the Jesuits in the Vatican” (p. 61). This is very interesting. It changes the character of the question. So science, instead of telling the Church with Kant that the theological question is unanswerable and indeed meaningless tries to rival the theological answer with an answer of its own. So I am not wronging Hawking when I blame him for wandering where science dare not tread.

“We are therefore fairly confident that we have the right picture, at least back to about one second after the big bang” (p. 62). That’s fairly near the beginning but I will not buy it for the genuine article. One second earlier, not before the bang but at the bang, was there something or nothing? I repeat, I am not questioning the scenario of the development of the universe from the situation one second or one millionth of a second after the big bang. I am asserting that it is not for science to say what made whatever that banged bang: even that would not be the beginning, for to bang it had to be there in the first place.

We are told that “one might as well cut the big bang, and any events before it, out of the theory, because they can have no effect on what we observe” (p. 63). That’s just it; science has to do solely with what we observe. The big bang with its strictly absurd and unapproachable singularity is a fiction.

Hawking cites (p. 64) the well-known ‘theory’ of a horde of monkeys hammering on typewriters and eventually producing a Shakespeare sonnet (in the original, as I remember, it was *Hamlet*). On the principles of probability this may be conceivable. But then the ‘sonnet’ would merely be an *ad hoc* arrangement of letters. The sense in the sonnet would only be produced by and appreciated by intelligence and it is this that no mechanical process can explain. This is not a comment on Hawking. I only mention this because it illustrates how the objective approach of science necessarily leaves out all meaning and all value. Socrates stated this clearly in the *Phaedo* but we are still blind to it.

I can imagine an intelligent universe, that is to say a universe whose ultimate reality is creative intelligence, where there is no animal life and no intelligent individuals. I do not see human intelligence as something special. As I often stated, we are only intelligent intermittently in fleeting moments. By intelligence I do not mean cleverness: I mean neither problem-solving capability nor scientific acumen: I mean the creative intelligence that is one in the glee of a baby and in Wordsworth’s ‘Surprised by joy’.

“Most sets of values would give rise to universes that, although they might be very beautiful, would contain no one able to wonder at that beauty” (p. 64). Why not say that the universe would sense its own vitality and its own harmony? I find that more intelligible than a ‘material’ universe with no mind. I cannot see any reality bereft of or apart from intelligence. I suppose this is what Kierkegaard had in mind when he said: “Truth is subjectivity”.

Thus scientists are busy proposing models of an initial configuration leading to the present state of the universe. They choose to call that the beginning. Let’s not quarrel about a word. Call it the beginning of the life of the universe as I may call my birth the beginning of my life. But was I nothing before I was born? Besides, is the observable universe the whole of Nature? It might be. But I adamantly protest that what science studies leaves out what is most important and of greatest value for us human beings. I am certain that Hawking as a person knows the value of beauty, of love, of imagination, of “devotion to something afar from the sphere of our sorrow”. But all that has no place and can have no place in science.

I think the long digression into the question whether the universe was made for humanity is quite out of place. This question cannot be decided rationally. It is

strictly meaningless. All arguments advanced on the one side can be countered by equally plausible arguments on the other side. Yet Hawking, reverting to the question, writes: “Was it all just a lucky chance? That would seem a counsel of despair, a negation of all our hopes of understanding the underlying order of the universe” (p. 67). Hawking refuses to despair; he jumps from this back to the problem of the beginning.

“If the classical theory of general relativity was correct, the singularity theorems that Roger Penrose and I proved show that the beginning of time would have been a point of infinite density and infinite curvature of space-time. All the known laws of science would break down at such a point. ... what the singularity theorems really indicate is that the gravitational field becomes so strong that quantum gravitational effects become important ... one has to use a quantum theory of gravity to discuss the very early stages of the universe. ... it is possible in the quantum theory for the ordinary laws of science to hold everywhere, including at the beginning of time ...” (p. 67-68).

At this point I will not add to what I have said already except to remark that we have to distinguish very carefully between “the beginning of time” and “the very early stages of the universe”: if these are equated, “the beginning of time” would be a misnomer of no metaphysical significance.

TIME. Ahead of reaching Ch. 9, The Arrow of Time, I’ll put down these thoughts: Time is a fiction. Time is a human invention. Time is a mode of the understanding (Kant). In nature there is no such thing as time, only ceaseless becoming. Rather than speaking of the irreversibility of time we should speak of the irreversibility of becoming. Why is becoming irreversible? Because all that exists passes away. To exist is to be in flux (Heraclitus), or as I say, to be transient. To become is to vanish. What is done cannot be undone. Surely we can re-do what was done before, we can amend, can refurbish, but all of that is new creation; what has gone cannot be recalled. Not because time goes forward but because all things are constantly being created and constantly passing away. Because being (reality) is not an entity or a state but is, as Plato says, *dunamis*, or as I say, creativity. All seeming permanence is not the child of time but is the gift of duration. Duration is the transcendent wholeness of the act. In my philosophy ultimate reality is the Act. The Act is eternal creativity, is Creative Eternity. (See Ch. XV, “Time, Duration, and Eternity”, *Quest of Reality*, 2013.)

We are told that “we may regard our use of imaginary time and Euclidean space-time as merely a mathematical device (or trick) to calculate answers about real space-time.” (p. 68) This is good as far as it goes, but we risk deluding ourselves

into thinking that our useful fictions reveal to us the nature of what is ultimately real. Weren't we told before that the fragrant rose and the luscious peach are really only electrons and neutrons? Aren't we being told that love and joy and sorrow are really neurons knocking about the brain? Whitehead called this the Fallacy of Misplaced Concreteness but scientists and philosophers alike paid no attention.

"If we knew the initial state of our universe, we would know its entire history." (p. 68) This is a very bold assumption vitiated by two defects. (1) The 'initial state' is always an *ad hoc* point. (2) The possibility of non-uniformity and irregularity in the initial situation is ignored.

"God may know how the universe began, but we cannot give any particular reason for thinking it began one way rather than another" (p. 69). Why don't we leave it at that? Instead we resort to a trick: "... the quantum theory of gravity has opened up a new possibility, in which there would be no boundary to space-time and so there would be no need to specify the behaviour at the boundary." Like a shrewd lawyer with a losing case resorting to a technical hitch. "The boundary condition of the universe is that it has no boundary." How can we have an initial state then? "The universe ... would neither be created nor destroyed, it would just BE." Doesn't that mean we can speak neither of beginning nor of end? Doesn't that amount to saying that the question is beyond our range?

More than once Hawking gives the earth as an example of finite space without boundaries. Surely the earth has no edge off which you can fall if you travel straight on. But is the earth unbounded? With a strong enough thrust from within or pull from without you would fly off the earth. This is not an argument against what Hawking is exemplifying; it merely says that the example is not apt. A finite space without boundaries cannot be represented by any imaginable example. It is one of the legion of faeries or genii that science finds serviceable.

"Even though the universe would have zero size at the North and South Poles, these points would not be singularities, any more than the North and South Poles on the earth are singular. The laws of science will hold at them, just as they do at the North and South Poles on the earth" (p. 69). This is simply a sleight of hand. The North (or South) Pole is either an area, an actual thing, or it is the mathematical centre of the area, which is not a real thing and which does not "start" the earth. So either the representation is starkly inapt or the thing represented is flawed. It is not for me to say which is the case. I am not discussing the science but the language in the name of simple commonsense. — "The laws of science will hold at them, just as they do at the North and South Poles on the

earth.” Do they? At the North and South Poles of the geographers the laws of science certainly do hold. But at the Euclidean centre? Certainly not!

“Only if we could picture the universe in terms of imaginary time would there be no singularities” (p. 70). [“Imaginary **time**: Time measured using imaginary numbers” (Glossary). No definition of imaginary number is given in the Glossary, but on p. 68 we are told that imaginary numbers “give negative numbers when multiplied by themselves”.] To escape one absurdity we embrace another absurdity. That one works better than the other does not give it a claim to reality. I insist on calling imaginary time absurd because though it may be a useful working fiction it becomes absurd when it is given a place in the actual world. The zero is a very useful tool, a most brilliant invention of the human mind, but if you go out looking for an actual zero in the outside world you will look in vain.

CHAPTER 9 – THE ARROW OF TIME

“Why do we remember the past but not the future?” (Ch. 9, p. 72) In remembering we do not go back to the past but reconstitute the past. The future is an idea; it has no place in the outer world; its only place is in the mind of a human being. A dog can recall in dreaming what it experienced yesterday but it cannot plan what to do tomorrow. Aristotle knew that a statement relating to the future is neither true nor false (*De Interpretatione*, 18a-b). The future is imaginable, probabilistically predictable, but not cognizable until it takes place.

“The laws of science do not distinguish between the past and the future” (p. 72). In the first place, this is a misleading statement. The laws of science that held in the past are expected to hold in the future, but they do not apply to a future that is actual now. Taken without caution the statement can lead to false conclusions. In the second place, the laws of science are essentially approximations. Einstein said: “As far as the laws of mathematics refer to reality, they are not certain, as far as they are certain, they do not refer to reality.” Scientific predictions are essentially provisional. The sun will come up tomorrow provided our galaxy is not blown up. Incidentally, Einstein is a rare instance of a scientist who could think lucidly and speak lucidly outside the boundaries of equations.

Every fertilized ovum, every seed planted in the ground, goes against the second law of thermodynamics. This is not a reversal of the arrow of time: this is creativity.

“It is rather difficult to talk about human memory because we don’t know how the brain works in detail. We do, however, know all about how computer memories work. I shall therefore discuss the psychological arrow of time for computers. I think it is reasonable to assume that the arrow for computers is the same as that for humans. If it were not, one could make a killing on the stock exchange by having a computer that would remember tomorrow’s prices!” (p. 74).

I intended not to comment on the argument but I cannot let this pass. It is basically flawed and it shows the fundamental fault in scientific thinking. Scientists do not know that the objective and the subjective are two completely different orders of being. They think that the mind can be reduced to the workings of the brain. The term ‘computer memory’ is a grossly misleading misnomer. Human memory does not go back to what happened but recreates what happened. A computer only ‘remembers’ what you fed into it; human memory infuses new meaning, new significance, into what it muses. The instance of ‘making a killing on the stock exchange’ is irrelevant. Computers can (possibly do) make very good predictions of ‘tomorrow’s prices’: that is not ‘remembering tomorrow’ but simply calculating probabilities. A computer playing chess can predict the next move of a competent chess player because the move follows rules but the computer cannot predict the next move of a poor player who blunders and sacrifices his queen. The nemesis of abusing language is terrible!

I have to say that I have been neither convinced nor enlightened by the argument of Ch. 9. Scientists, as soon as they leave their equations and empirical observations behind them make very poor thinkers. This has nothing to do with their IQ. I think Bertrand Russell once said that only very learned persons can believe utter absurdities.

CHAPTER 10 – WORMHOLES AND TIME TRAVEL

Scientists have got to where fact and fancy and sheer nonsense are equally permissible. In Gödel’s space-time “it would be possible for someone to go off in a rocket ship and return to earth before he set out” (Ch. 10. p. 77). In the good old days theologians would readily confess that is something God cannot do. To their credit they believed God obeyed reason. Because scientists can formulate equations that formally satisfy this fancy, they convince themselves and want to convince us that this nonsense makes sense. Hawking goes on to say: “The solution Gödel found doesn’t correspond to the universe we live in because we can show that the universe is not rotating” and finds other faults with the ‘solution’ but he obviously doesn’t find the idea nonsensical. So we read that “other more

reasonable space-times that are allowed by general relativity and which permit travel into the past have since been found.” Are all varieties of space-times any better than fables? Gulliver’s travels (even apart from their allegorical sense and literary merit) are far better than our scientists’ proposed space-time travels.

“One might hope therefore that as we advance in science and technology, we would eventually manage to build a time machine.” (p. 79). Perhaps the ‘laws of physics’ say that is possible. The laws of reason say it is nonsense. I prefer to follow reason because the laws of physics have been changing from Archimedes to Hawking and there is no guarantee they will not be overturned tomorrow. But that is neither here nor there. I insist on three points: (1) Scientists have not only not reached a beginning but they have shown that they have no conception of what a metaphysical beginning means and with all their talk of time and space-time their conception of time remains that which Zeno of Elea ridiculed. (2) Whatever science may achieve in the way of theory and technology it can know nothing of what is ultimately real and can know nothing about questions of value. (4) All that science can achieve in the way of amassing knowledge and advancing technology adds absolutely nothing to human worth and human wellbeing which have quite another source, and I am decidedly not referring to any supernatural source.

“Of course, one could say that free will is an illusion anyway” (p. 80). Not only scientists have been saying this but also philosophers seduced by science. They would rather deny what we know immediately in ourselves than question the fictions of science. Hawking says: “If there really is a complete unified theory that governs everything, it presumably also determines your actions” (p. 80). I would say that is an argument against the possibility of a theory of everything. A unified theory would be at the highest level of generality and at the farthest remove from reality. Hawking continues: “But it does so in a way that is impossible to calculate for an organism that is as complicated as a human being. The reason we say that humans have free will is because we can’t predict what they will do.” This turns Leibniz’ subterfuge upside down. Leibniz equates free will with unpredictability to trick the Church. Hawking reduces free will to unpredictability to salvage determinism. The reason why you cannot predict the outcome of free will is not that humans are complicated but that humans are creative. And I have to explain that I am speaking not of choice, which is always conditioned by antecedents, but of creative spontaneity. And it is because all reality is creative that you will never have a meaningful or workable theory of everything, except as a bare schema that cannot rule out variations and irregularities.

Hawking concludes Chapter 10 saying: “Thus the possibility of time travel remains open.” I say: There is no actual past; there is no actual future; there is no actual

time. These are ideas with which we fashion and shape the only actual existent, the present moment. You cannot travel backwards to a non-existent past nor travel forwards to a non-existent future. So the whole rigmarole is a will-o'-the-wisp.

Newton believed in absolute space and absolute time. Scientists had reason to abandon these. They merged them in space-time. Now they believe in an actual space-time or numerous actual space-times existing out there in the universe. This is the root of all their troubles. Space-time is an idea, no less than classical space or time or force or gravity. Actual astronauts can travel in actual space and the idea of space-time can help work out the details of the journey, but to imagine sending actual astronauts on journeys in a conceptual space-time with its curvatures, antiparticles, negative energy, infinite density and all that is – I'm looking for the least offensive word – foolish.

CHAPTER 11 – THE UNIFICATION OF PHYSICS

In string theories “the basic objects are not particles, which occupy a single point of space, but things that have a length but no other dimension, like an infinitely thin piece of string” (Ch. 11, p. 83). It may be all right to work out calculations with “things that have a length but no other dimension”, after all we have been working with points and lines for millennia, but to expect these licensed absurdities to give us a true picture of the actual world is, to say the least, rash.

Let me foolishly stick my neck out. What does the unification of quantum mechanics and general relativity amount to? General relativity “explains the force of gravity in terms of the curvature of a four-dimensional space-time” (Glossary). At the heart of quantum mechanics is the uncertainty principle which stipulates that “one can never be exactly sure of both the position and the velocity of a particle; the more accurately one knows the one, the less accurately one can know the other” (Glossary). Thus a principle that acknowledges our inability to ascertain the position and velocity of a particle at any given moment is to be combined with a working fiction and that is supposed to provide us with a law determining the whole course of the universe down to the emergence of humans and onwards to our final doom. I am not saying you cannot have a general law for natural processes. We have been having such laws from the first humans that applied fire to metals through Galileo and Newton down to the present day. But you buy generality at the cost of leaving out factual content. And to my mind what science leaves out is what is most important.

Different string theories “appear to be different approximations to some fundamental theory that are valid in different situations” (p. 90). Doesn’t the uncertainty principle suggest that this is what we should expect? That the ‘fundamental theory’ is unreachable, incalculable? Isn’t this a confirmation of the view that all scientific laws, all scientific theories, are approximations? And doesn’t this follow from the inescapable fictionality of all fundamental scientific concepts? May not the final truth about human knowledge be that in truth we know nothing? And does this not agree with Kant’s affirmation that all human knowledge is confined to phenomena and that we cannot penetrate beyond phenomena? And doesn’t this agree with the Platonic position that the only reality we know is the mind and the ideas in the mind and that all that is outside the mind is shadow of shadows? And further that the one reality that is our inner reality is strictly ineffable and can only be intimated in myth and allegory and parable?

At one point in the last couple of pages in Chapter 11 Hawking seems inclined to leave all possibilities open but then declares confidently: “I think that there is a good chance that the study of the early universe and the requirements of mathematical consistency will lead us to a complete unified theory within the lifetime of some of us who are around today, always presuming we don’t blow ourselves up first” (p. 91). Following that he goes on to soften and to dampen the confident enthusiasm and several times he takes away by the left hand what he gives by the right hand.

“What would it mean if we actually did discover the ultimate theory of the universe? As was explained in Chapter 1, we could never be quite sure that we had indeed found the correct theory, since theories can’t be proved. But if the theory was mathematically consistent and always gave predictions that agreed with observations, we could be reasonably confident that it was the right one.” (p. 91). In what sense would it be the right one? Only in the sense that we finally find it satisfactory for our purposes, but I insist that no scientific theory can tell us what is ultimately real.

Chapter 11 ends with a passage that I cannot let go without a couple of remarks. Hawking says that

“we have, as yet, had little success in predicting human behavior from mathematical equations! So even if we do find a complete set of basic laws, there will still be in the years ahead the intellectually challenging task of developing better approximation methods, so that we can make useful predictions of the probable outcomes in complicated and realistic situations. A complete, consistent,

unified theory is only the first step: our goal is a complete *understanding* of the events around us, and of our own existence” (p. 91).

My first remark concerns predictability. I insist that what stands in the way of predicting human behavior is not the complexity of the subject or the inadequacy of our methods but the spontaneity of the human act. And I repeat: we can make fairly accurate predictions in the case of choice between alternatives but can never predict the outcome of creative spontaneity. I go further: we cannot predict happenings in nature to the last detail. Nature is good-natured and normally acts in character like a well-behaved person; but both nature and your well-behaved friend are creative and full of surprises.

My second remark relates to understanding. Science tells us how things come about and how to predict (within limits) and manipulate (within limits) things and events around us. Scientists may be satisfied with that kind of understanding. But there is a deeper understanding that answers the question ‘why?’ (not ‘how?’) and there is no way to answer that question with regard to things and events in nature. Then there is the far more serious and more important matter of understanding ‘our own existence’. No amount of study of the universe, of the human body, or the human brain, can make us understand a human being. Only our subjective reality, our mind, and the ideas, ideals, and values in the mind, can give us understanding of ourselves.

It is not science that can give us understanding of ourselves or of the world. Modern science has given us power, power that we have been using and continue to use foolishly. It is not even most of what goes nowadays by the name of philosophy, but a philosophy that probes our inner reality. And it is poetry and creative literature and creative art. The way to understand ourselves and to find meaning and value in the world is to look within not without.

CHSPTEr 12 – CONCLUSION

“The uncertainty principle of quantum mechanics implies that certain pairs of quantities, such as the position and velocity of a particle, cannot both be predicted with complete accuracy. Quantum mechanics deals with this situation via a class of quantum theories in which particles don’t have well-defined positions and velocities but are represented by a wave” (Ch. 12, p. 93).

Does this not suggest that position and velocity as elementary terms determining an object prove as inadequate as the concepts of space and time taken separately?

Does it not suggest that the first building-blocks of things are not bodies or quantities but events? Is not this the insight A. N. Whitehead arrived at and found support for in Plato's assertion that all things are ultimately nothing but *dunamis*? I wonder if Hawking ever read Whitehead's *Process and Reality*. That book presents a rational cosmology as a set of concepts in terms of which we may describe the cosmos, without pretending to any finality. Whitehead did not presume that his cosmology dealt with what is most important and of highest value to human beings. He tackled questions of meaning and value and purpose in his other philosophical works. The objective methods of science can never approach these themes.

Hawking finds that quantum theories are (in a certain sense) deterministic, though he seems to support my initial suggestion above when he says: "The unpredictable, random element comes in only when we try to interpret the wave in terms of the positions and velocities of particles. But maybe that is our mistake: maybe there are no particle positions and velocities, but only waves." He goes on to say: "It is just that we try to fit the waves to our preconceived ideas of positions and velocities. The resulting mismatch is the cause of the apparent unpredictability" (p. 93). To my mind the cause is much deeper. Determinism is in error basically because it denies or ignores the creativity of nature. I believe that all reality is creative. Among philosophers Bergson and Whitehead came nearest to this view. It is the central principle of the philosophy I have been propounding in all my writings; this is not the place to expound it fully.

The last portion of the concluding chapter has knocked me down. Every sentence calls for comment, but if I do that I would be doubling the length of this paper, even without quoting the text I commented on. First Hawking formulates all the ultimate questions and clearly acknowledges that they are unanswerable. So in a way he makes all that I have blabbered so far beside the point. Still I don't think it has been a waste, because most scientists and some of our present-day philosophers can't see that those ultimate questions are beyond human ken. Let this suffice for the first part of this remarkable concluding passage.

Hawking says:

"Up to now, most scientists have been too occupied with the development of new theories that describe *what* the universe is to ask the question *why*. On the other hand, the people whose business it is to ask *why*, the philosophers, have not been able to keep up with the advance of scientific theories" (p. 94).

In all my writings I have maintained that science and philosophy are two distinct domains concerned with two totally distinct realms. The ultimate 'why' question is

beyond the reach of reason. But philosophy finds that the only reality we are given to know is our own inner reality. It is this that philosophy probes but can never exhaust. Philosophical investigation can never give us factual knowledge about the external world and the methods of science can never approach subjective reality. But I cannot expand on this here.

Yet Hawking cannot rest in the skeptical position he clearly expressed earlier, so his concluding lines read:

“However, if we do discover a complete theory, it should in time be understandable in broad principle by everyone, not just a few scientists. Then we shall all, philosophers, scientists, and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason – for then we would know the mind of God” (p. 94).

It is significant that the very last word in the text is ‘God’. God features 48 times in this book of less than a hundred pages, showing that Hawking is walking on a razor’s edge between physics and metaphysics. This may perhaps justify my foolhardy attempt to engage the redoubtable Hawking in this paper.

Cairo, March 13, 2016.